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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/840,235	04/24/2001	Penny G. Warren	N.C.82,413	3487

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EXAMINER	
LAROSE, COLIN M	
ART UNIT	**PAPER NUMBER**
2624	

DATE MAILED: 10/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/840,235	WARREN ET AL.	
	Examiner	Art Unit	
	Colin M. LaRose	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *7 August 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *24,27-29,31-33 and 36-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *24,27-29,31-33 and 36-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Arguments and Amendments

1. Applicant's amendments and arguments filed 7 August 2006, have been entered and made of record.

Response to Amendments and Arguments

2. Applicant has amended independent claims 24 and 33 to denote that "diagnostic information" is displayed.

Applicant explains that diagnostic information can correspond to e.g. "scatter plot" pixel distributions described in the Specification at pages 11 and 12. It is apparent that neither Waxman, Watkins, nor Givens discloses or suggests the display of scatter plot information, which is an example of the claimed "diagnostic information."

On pp. 10-11 of the Specification, another kind of diagnostic information is described – the separate display of image data from different sensors, such as visual (VIS) and short-wave infrared (SWIR) image data, before the data is fused together. Displaying the image data in this manner "allow[s] the operator to examine the output separately before the color fusion step."

In a similar vein, Watkins discloses displaying image data from different sensors for "diagnostic" purposes. Figure 2 of Watkins shows the successive display of different combinations of fused image data and standard visible image data. Figure 2(a) shows the scene, as it would appear to the naked eye, using only the visible image data and none of the fused image data. Figure 2(b) shows an overlay of the fused image data at one-quarter intensity and the standard visible data at three-quarters intensity. Likewise, Figures 2(c) and 2(d) represent one-

half/one-half and three-quarters/one-quarter combinations, respectively. See column 5/57 through column 6/16.

Such a successive display of the fused image data in combination with the standard visible image data is diagnostic in the sense that it "permit[s] the observer to see the true colors of the scene and at the same time observe the RGB enhanced stereo sensor fusion data." Column 6/32-35. That is, it allows a viewer to more easily "diagnose" the scene visually – e.g., to identify targets that are only perceivable with the fused image data while observing the context around the target using the standard visible data.

Claim Objections

3. In light of Applicant's amendments, the previous claim objections have been withdrawn.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 24, 27-28 and 31-33, and 36-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,555,324 by Waxman et al. ("Waxman") in view of U.S. Patent 6,597,807 by Watkins et al. ("Watkins") and U.S. Patent 5,581,638 by Givens et al. ("Givens").

Regarding claims 24 and 33, Waxman discloses an image processing apparatus/method (figure 4) for processing imaging data in a plurality of spectral bands and fusing the data into a color image, comprising:

two imaging sensors (cameras 310 and 312);

at least two image-acquiring sensor areas located on said two imaging sensors (i.e. a first sensor area on camera 310 and a second sensor area on camera 312), wherein each said sensor is sensitive to a different spectral band than at least one other of said sensor areas (sensor area for camera 310 is sensitive to visible-near IR spectral band, and sensor area for camera 312 is sensitive to long-wave IR spectral band) and generates an image output representative of an acquired image in the spectral band to which the sensor area is sensitive (sensors for cameras 310 and 312 produce visible/near IR and long-wave IR images, respectively);

a frame grabber connected to said imaging sensors (A/D converters 328 digitize and transmit frames of image data to the processors);

a general purpose computer (processor 330 is a general-purpose computer that performs various functions) connected to said imaging sensors for executing in real time:

a registration algorithm registering said image outputs (vision processor 392 contains processors 360 and 362 (see fig. 6), which execute algorithms registering and generally preprocessing the image outputs); and

a color fusion algorithm for combining said image outputs into a single image (fig. 6 shows the execution of the algorithm for combining the VIS-NIR and LWIR image signals into a single RGB image).

Waxman does not expressly teach that there are three image-acquiring sensor areas, as claimed. As shown in figure 4, Waxman utilizes a pair of image sensors, wherein each sensor is sensitive to a different spectral band. [The cameras share the same field of view and are focused along a common axis - col. 10/42-45.]

Therefore, in Waxman's system, there are only two "image-acquiring sensor areas * * * sensitive to a different spectral band," as claimed.

Also, Waxman discloses an operator interface as previously indicated, but Waxman does not disclose the display of "diagnostic information" on the interface, as claimed.

Watkins discloses an image fusion system (figure 1) that is similar to Waxman's system. Like Waxman, Watkins utilizes cameras that are sensitive to more than one spectral band. The different spectral images captured from each sensor are fused into a single image according to RGB color codes. Then, the fused images of each stereo camera are displayed to e.g. the left and right eyes of a user - see col. 4/35-48.

But whereas Waxman's cameras are sensitive in only two different spectral bands (VIS-NIR & LWIR), Watkins's cameras are each sensitive to three spectral bands (Near-IR, Mid-IR,

and Far-IR). Watkins's sensors thus contain "three image-acquiring sensor areas * * * sensitive to a different spectral band."

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Waxman by Watkins to achieve the claimed invention by employing three image-acquiring sensor areas sensitive to different spectral bands, as taught by Watkins. Watkins teaches that acquiring three different spectral images and then fusing those images together according to color for display to a user provides a representation of a viewed scene that capitalizes on the properties of the human visual system to offer enhanced target recognition capabilities. Specifically, capturing and displaying three different spectral images in the manner taught by Watkins takes advantage of a human's preattentive vision characteristics to allow objects in a scene to be identified more easily. See column 3/25-53 and column 4/48-67.

Watkins discloses displaying image data from different sensors for "diagnostic" purposes. Figure 2 of Watkins shows the successive display of different combinations of fused image data and standard visible image data. Figure 2(a) shows the scene, as it would appear to the naked eye, using only the visible image data and none of the fused image data. Figure 2(b) shows an overlay of the fused image data at one-quarter intensity and the standard visible data at three-quarters intensity. Likewise, Figures 2(c) and 2(d) represent one-half/one-half and three-quarters/one-quarter combinations, respectively. See column 5/57 through column 6/16.

Such a successive display of the fused image data in combination with the standard visible image data is diagnostic in the sense that it "permit[s] the observer to see the true colors of the scene and at the same time observe the RGB enhanced stereo sensor fusion data." Column

6/32-35. That is, it allows a viewer to more easily "diagnose" the scene visually – i.e., to identify targets that are only perceivable with the fused image data while observing the context around the target using the standard visible data.

Based on the above teaching by Watkins, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Waxman by Watkins to display "diagnostic information" to an operator, as claimed.

While Waxman teaches that the registration algorithm performed by preprocessors 360 and 362 compensates for alignment, distortion errors, and the like (see column 13/37-40), Waxman does not expressly teach that the algorithm involves "scaling the image outputs," as claimed.

Givens discloses a method for autonomous image registration for aligning two images having a common coverage area, such as those images obtained by Waxman in figure 6. In particular, Givens teaches that the process of registering two images having a common coverage area conventionally involves scaling down the images (see column 5, lines 36-45: the images are resampled at 1/8X magnification and then minified at a magnification of 1/32X magnification).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Waxman and Watkins by Givens to achieve the claimed invention by including a scaling operation of the images in the registration algorithm, as claimed, since Givens teaches that scaling common-coverage area images to be registered was a conventional image processing technique employed during an image registration process in order to reduce the images to a very low resolution (see column 5/36-45). The registration operations subsequently performed on the

images reduced by 32X would then be much less computationally intensive than if those operations were performed on the full resolution images.

Regarding claims 27 and 36, the combination of Waxman and Watkins teaches the color fusion algorithm is simple color fusion whereby each sensor area image output is separately assigned to a different color based on wavelength (Waxman, figure 6: colors are assigned on the basis of the wavelegnth being VIS-NIR or LWIR; and Watkins teaches that for each of the three different spectral images, RGB color codes are assigned based on the wavelengths thereof to create a single fused color image).

Regarding claims 28 and 37, the combination of Waxman and Watkins teaches the color fusion algorithm is based on principle component color fusion whereby said sensor area outputs are fused into one image (Waxman, column 3, lines 28-43: the assigned RGB color codes are converted to the HVS color space to form a single, color-fused image).

Regarding claims 31 and 38, Watkins teaches that each sensor comprises three sensors, each configured to map its image to an associated color channel (see figure 1), and a fusion algorithm is configured to combine the color channels into a color image (see figure 1: the color channels for each stereo camera are combined into right and left composite video signals).

Regarding claims 32 and 39, Watkins teaches the three sensors are sensitive to NIR, MWIR, and LWIR spectral bands (see figure 1).

Regarding claim 40, the combination of Waxman and Watkins teaches the processing and fusing of said image occurs in real time (Waxman, column 11, lines 1-4).

7. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,555,324 by Waxman et al. ("Waxman") in view of U.S. Patent 6,597,807 by Watkins et al. ("Watkins") and U.S. Patent 5,581,638 by Givens et al. ("Givens"), as applied to claim 28, and further in view of U.S. Patent 4,533,938 by Hurst.

Regarding claim 29, Waxman discloses performing a PCCF algorithm (i.e. converting RGB to HVS values) in order to perform "desirable color manipulations" within the HVS space (column 15, lines 5-21). Processor 520, figure 10, is capable of performing color transformations to produce desirable effects on the image to be displayed.

Waxman does not disclose desaturating the HVS image, since Waxman's shunting algorithms produce images that are typically unsaturated (column 8, lines 48-51). However, should the final color image be saturated, it would have obvious to utilize processor 520 to desaturate the HVS image using any of the well-known desaturation techniques in order to enhance the image for display.

For example, Hurst discloses an image processing system wherein a desaturation signal is added to the image signal when a hue value is modified (see Abstract). This desaturation signal is added in order to minimize the changes in saturation when the hue is modified. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Waxman by Hurst to desaturate the fused output image, as claimed, since Waxman teaches that a user to allowed to adjust the hue of the output image, and Hurst teaches that, as part of the logistics of adjusting the hue of an image signal, it is advantageous to desaturate the image so that changes in saturation attributable to the changing of the hue are minimized (see Abstract and column 1, lines 11-28 and column 2, lines 30-38).

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

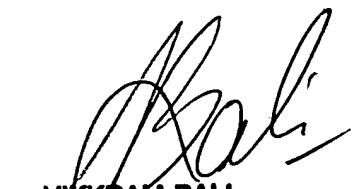
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Colin M. LaRose whose telephone number is (571) 272-7423. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jingge Wu, can be reached on (571) 272-7429. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR

system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000. Any inquiry of a general nature or relating to the status of this application or proceeding can also be directed to the TC 2600 Customer Service Office whose telephone number is (571) 272-2600.

Colin M. LaRose
Group Art Unit 2624
15 October 2006



VIKKRAM BALI
PRIMARY EXAMINER